

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Ulf Dietrich et al.

Serial No.: 10/551,108

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Examiner: Doris L. Lee

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

Mail Stop Appeal Brief - Patents
Commissioner for Patents
U.S. Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an Appeal Brief from the final rejection of claims 16-20, 22-29, and 31-35 of the Office Action mailed on December 21, 2009 for the above-identified patent application.

I. REAL PARTY IN INTEREST

The real party in interest is Wacker Chemie AG ("Assignee"), a corporation organized and existing under the laws of Germany, and having a place of business at Hanns-Seidel-Platz 4, D-81737 München, Germany, as set forth in the assignment recorded in the U.S. Patent and Trademark Office on 10/01/2008 at Reel 021603/Frame 0608.

II. RELATED APPEALS AND INTERFERENCES

There are no appeals, interferences or judicial proceedings known to the Appellant, the Appellant's legal representative, or the Assignee which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 16-20, 22-24, and 31-35 are pending in this application. Claims 16-20, 22-29, and 31-35 have been rejected and are the subject of this appeal. Claims 1-15, 21, and 30 have been cancelled.

IV. STATUS OF AMENDMENTS

No amendment after final rejection has been filed.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The subject matter of claim 16 is directed to a cement plasticizer prepared by copolymerizing a mixture of monomers consisting essentially of:

- a) 5 to 70 wt. % of one or more monomers selected from the group consisting of ethylenically unsaturated monocarboxylic acids, ethylenically unsaturated carboxamides, ethylenically unsaturated C₄₋₈ dicarboxylic acids and anhydrides thereof, and (meth)acrylate monoesters of C₂₋₈ dialcohols;
- b) 1 to 40 wt. % of one or more monomers selected from the group consisting of ethylenically unsaturated compounds with sulfonate or sulfate functional groups,
- c) 10 to 80 wt. % of one or more monomers selected from the group consisting of ethylenically unsaturated compounds of homopolyoxyethylene glycols with 1 to 300 oxyethylene units and terminal groups selected from the group consisting of OH-groups and ether groups -OR' and mixtures thereof, wherein R' is an alkyl, aryl, alkaryl or aralkyl residue with 1 to 40 C atoms,
- d) 5 to 80 wt. % of one or more monomers selected from the group consisting of ethylenically unsaturated compounds of polyoxyalkylene glycols consisting of 1 to 300 C₃₋₄ oxyalkylene units and terminal groups selected from the group consisting of OH-groups and ether groups -OR' and mixtures thereof, wherein R' is an alkyl, aryl, alkaryl or aralkyl residue with 1 to 40 C atoms, and,

- e) optionally, 0.5 to 10 weight percent of one or more hydrophobic comonomers selected from the group consisting of (meth)acrylate esters of C₁₋₁₅ alcohols and vinylaromatics, said copolymer having pendant polyoxyalkylene moieties derived from monomers c) and d) the weight percentages based on the total weight of the copolymer, and totaling 100 wt. %.

(Page 3, line 31 to page 4, line 20; claim 1 as filed).

The subject matter of claim 23 is directed to a plasticizer of claim 16 which, when employed in self leveling, hydraulically setting mixtures, on loading in the linear viscoelastic region, the storage modulus G' is higher than the loss modulus G'', on loading outside the linear viscoelastic region a tangent of the loss angle of < 80 results, and on subsequent relaxation within less than 15 mins the storage modulus G' is again higher than the loss modulus G''. (Page 10, line 12 to page 11, line 36; claim 8 as filed.)

Claim 24 is directed to the spray drying of aqueous polymer dispersions of homo- or copolymers of one or more monomers selected from the group consisting of vinyl esters of unbranched or branched alkylcarboxylic acids with 1 to 18 C atoms, acrylate esters and methacrylate esters of branched and unbranched alcohols with 1 to 15 C atoms, dienes, olefins, vinylaromatics and vinyl halides, in which a dispersant is employed, the improvement comprising selecting as at least one dispersant, a dispersant of claim 16. (Page 7, lines 23-26; page 7, lines 34 to page 9, line 2; page 15, lines 4-21; claim 10 as filed.)

Claim 33 is directed to a composition containing a redispersible polymer powder and the dispersant of claim 16, wherein the redispersible polymer powder is a homo- or copolymer of one or more monomers selected from the group consisting of vinyl esters of optionally branched C₁₋₁₈ alkylcarboxylic acids, (meth) acrylate esters, of optionally branched C₁₋₁₅ alcohols, dienes, olefins, vinyl aromatics, and vinyl halides, the dispersant prepared by spray drying an aqueous polymer dispersion of the redispersible polymer with the copolymer of

claim 16. (Page 7, lines 23-26; page 7, line 34 to page 9, line 2; page 15, lines 4-21; claim 12 as filed.)

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

- A. Claims 16-20, 22-23, 25, 27, 29, and 31-32 Stand Rejected Under 35 U.S.C. § 103(a) over *Hirata* et al. EP 0 792 850 ("*Hirata*")**
- B. Claims 24 and 26 Stand Rejected Under 35 U.S.C. § 103(a) over *Hirata* in View of *Haerzschel* et al. U.S. 6,106,113 ("*Haerzschel*")**
- C. Claim 28 Stands Rejected Under 35 U.S.C. § 103(a) Over *Hirata* in View of *Haerzschel* further in View of *Debus* et al. U.S. 4,137,088 ("*Debus*")**
- D. Claims 33-35 Stand Rejected Under 35 U.S.C. § 103(a) Over *Hirata* in View of *Okazaki* (Derwant Abstract of JP 09-249442 ("*Okazaki*")**

VII. ARGUMENT

The claimed invention, as indicated by the independent and dependent claims in Section V herein, are directed to particular cement plasticizer ("cement dispersant") compounds, to their use, and to compositions containing these plasticizers together with a redispersible polymer powder.

"Dispersants" in the context of the invention, are compounds which, when added to cementitious compositions such as mortars, self-leveling floor screeds, etc., increase the flowability of the composition. Thus, either less water can be used in mixing the mortar, etc., or a higher flowability can be obtained, or both. Flowability is often measured by slump, the degree of settling of a mortar specimen, measured in mm or cm, after defined time periods. It is usually desirable that the slump be high and remain substantially constant for some extended period of time. This is said to increase the "workability" of cementitious compositions

containing the dispersant. Dispersants are also known, perhaps more commonly, as "plasticizers" in the art. This term will be used throughout the brief.

One of the commonly used plasticizers is casein, derived from milk solids. Casein is an effective plasticizer, providing excellent plasticizing properties, and thus workability. Unfortunately, casein, being a proteinaceous natural product, is subject to microbial attack. Numerous "artificial" or "synthetic" plasticizers have been proposed by the art. While less subject to microbial attack, such plasticizers do not have the same workability of casein. *See* page 3, lines 11-30. It was an object of the invention to provide a plasticizer which mimics casein, without the drawback of susceptibility to microbial growth.

Appellants solved this problem by providing a novel dispersant which is a copolymer of four different classes of monomers. These classes are as follows:

- a) 5 to 70 wt. % of one or more monomers selected from the group consisting of ethylenically unsaturated monocarboxylic acids, ethylenically unsaturated carboxamides, ethylenically unsaturated C₄₋₈ dicarboxylic acids and anhydrides thereof, and (meth)acrylate monoesters of C₂₋₈ dialcohols;
- b) 1 to 40 wt. % of one or more monomers selected from the group consisting of ethylenically unsaturated compounds with sulfonate or sulfate functional groups,
- c) 10 to 80 wt. % of one or more monomers selected from the group consisting of ethylenically unsaturated compounds of homopolyoxyethylene glycols with 1 to 300 oxyethylene units and terminal groups selected from the group consisting of OH-groups and ether groups -OR' and mixtures thereof, wherein R' is an alkyl, aryl, alkaryl or aralkyl residue with 1 to 40 C atoms,
- d) 5 to 80 wt. % of one or more monomers selected from the group consisting of ethylenically unsaturated compounds of polyoxyalkylene glycols consisting of 1 to 300 C₃₋₄ oxyalkylene units and terminal groups selected from the group consisting of OH-

groups and ether groups –OR' and mixtures thereof, wherein R' is an alkyl, aryl, alkaryl or aralkyl residue with 1 to 40 C atoms.

Thus, the claimed plasticizers contain a C=O group containing monomer, preferably acrylic acid (monomer a)); a sulfate- or sulfonate-group-containing monomer, preferably 2-acrylamido-2-methylpropane sulfonate (monomer b)); a polyoxyethylene ether group-containing monomer, preferably a methacrylate polyoxyethylene glycol methyl ether (monomer c)); and a polyoxy(propylene or butylene) group-containing monomer, preferably a methacrylate polyoxypropylene glycol (monomer d)). These monomers must be present in the weight percentages recited in claim 16. Plasticizers containing sulfonate groups are known. However, such plasticizers result in massive destabilization of polymer dispersions which are also used in cementitious compositions. *See, e.g.* the specification on page 1, line 33 to page 4, line 21. Thus, there has been a prejudice in the art against using sulfonate group-containing plasticizers.

As is well known in the art of polyoxyalkylene polyethers, polyoxyethylene polyethers are water soluble and hydrophilic, while polyoxypropylene polyethers and polyoxybutylene polyethers are hydrophobic and non-water soluble. The claimed copolymers thus have a unique blend of water soluble and water insoluble comonomers. The products are not only useful as plasticizers in hydraulically setting systems, but can also be used, quite surprisingly, as drying aids in the spray drying of redispersible polymer powders ("RDP"). As is well known, RDPs are unique polymer powders produced by spray drying a dispersion of solid polymer particles produced by aqueous emulsion polymerization, the spray drying taking place in the presence of a water soluble protective colloid which surrounds the polymer particles during drying so that they cannot coalesce or agglomerate. Upon addition to water, the RDPs redisperse with simple stirring to produce an aqueous dispersion having the same particle size and particle size distribution as the dispersion had prior to spray drying. The most common protective colloid used in spray drying to produce RDPs is polyvinyl alcohol. It is especially surprising that the

plasticizers of the invention are suitable spraying aids for RDPs, since polymers containing sulfonate groups have lead in the past to massive destabilization and coagulation, as indicated previously.

A. The Rejection Over *Hirata*

Hirata is directed to providing compositions which retain slump. However, *Hirata* is not directed to compositions which both retain slump and mimic the behavior of casein.

Hirata discloses four classes, or "types," of additives i) to iv), below:

- i) (page 2, line 32 to page 3, line 19; claim 1) copolymer of:
 - a) ethylenically unsaturated carboxylic acid,
 - b) ethylenically unsaturated polyoxyalkylene glycol with short chain length m, and
 - c) ethylenically unsaturated polyoxyalkylene glycol with longer chain length n ($n > m$);
- ii) (page 3, line 21 to page 4, line 27; claim 3) mixture of
 - 1. a copolymer of
 - a) ethylenically unsaturated carboxylic acid, and
 - b) ethylenically unsaturated polyoxyalkylene glycol with shorter chain length m, and
 - 2. a copolymer of
 - a) ethylenically unsaturated carboxylic acid, and
 - b) ethylenically unsaturated polyoxyalkylene glycol of longer chain length n;
- iii) (page 4, line 29 to page 5, line 3; claim 6) a mixture of:
 - 1. a copolymer of
 - a) ethylenically unsaturated carboxylic acid, and
 - b) ethylenically unsaturated polyoxyalkylene glycol, and

2. at least one cement dispersant which is a naphthalene based dispersant, an aminosulfonic acid based dispersant, a polycarboxylic acid based dispersant, or lignin; and
- iv) (page 5, lines 4-17; claim 9) A mixture of:
1. a polycarboxylic acid copolymer, and
 2. at least one naphthalene based dispersant, aminocarboxylic acid based dispersant, polycarboxylic acid based dispersant, or lignin based dispersant.

Of these four distinctly different embodiments of *Hirata*, none of which are distinguished from the others in terms of performance, only the first embodiment is of any relevance to the claimed invention at all. In this embodiment, as indicated previously, the copolymer is derived from an unsaturated carboxylic acid such as methacrylic acid,¹ a methoxy-terminated polyoxethylene glycol methacrylate of short chain length, and a methoxyethylene glycol methacrylate of long chain length. None of the Examples contain an ethylenically unsaturated sulfate or sulfonate comonomer as required by Appellants.

Hirata indicates that his copolymers may also include optional comonomers d) in amounts of 0-50% by weight. These optional comonomers are defined broadly without any "distinction" as "copolymerizable with the monomers mentioned above" (page 3, lines 17-18.) Thus, the broad disclosure of *Hirata* includes hundreds if not thousands of copolymerizable comonomers d).

On page 7, lines 35-47, *Hirata* gives "typical examples" of such monomers. Note that these are examples only, not "preferred." None of the comonomers d) are stated to be preferred.² This portion of *Hirata* reads as follows:

¹ Used in all *Hirata* examples.

² Only one d) comonomer is used in any example, as discussed below. This comonomer is ethylacrylate.

The monomer (d) is a monomer which is copolymerizable with the monomers (a), (b), and (c). As typical examples of the monomer (d), diesters of such dicarboxylic acids as maleic acid, fumaric acid, citraconic acid, mesaconic acid, and itaconic acid with such alcohols as are represented by $\text{HO}(\text{R}^8\text{O})\text{PR}^9$, wherein R^8O is one oxyalkylene group of 2 - 4 carbon atoms or a mixture of two or more such oxyalkylene groups and, in the case of a mixture of two or more oxyalkylene groups, these groups may be added in a block form or a random form, P is the average addition number of mols of oxyalkylene groups and represents an integer in the range of 1 - 100, and R^9 is a hydrogen atom or an alkyl group of 1 - 22, preferably 1 - 15 carbon atoms); unsaturated amides such as (meth)acryl amide and (meth)acryl alkyl amide, vinyl esters such as vinyl acetate and vinyl propionate; unsaturated sulfonic acid such as vinyl sulfonic acid, (meth)allyl sulfonic acid, sulfoethyl (meth)acrylate, 2-methyl propane sulfonic acid (meth)acryl amide, and styrene sulfonic acid and monovalent metal salts, divalent metal salts, ammonium salts, and organic amine salts thereof; aromatic vinyls such as styrene and a-methyl styrene; ester of aliphatic alcohols of 1 - 18, preferably 1 - 15, carbon atoms or esters of such phenyl group-containing alcohols as benzyl alcohol with (meth)acrylic acids may be cited. These monomers may be used either singly or in the form of a mixture of two or more members. (Emphasis added.)

(1)³
(2)
(3)
(4)
(5)
(6)
(7)

No less than seven distinct classes of monomers are recited here.

The question of obviousness boils down to whether *Hirata* would direct the skilled artisan to the claimed compositions. In this case, the answer is clearly "no."

Appellants' claimed compositions differ from those disclosed by *Hirata* in numerous ways. In viewing *Hirata*, one skilled in the art would assume, absent language to the

³ Numbers in parentheses single out the seven very different classes of examples of comonomers d).

contrary, that the examples of *Hirata* represent his preferred compositions.⁴ In all the examples which are relevant at all to Appellants' claimed compositions, *Hirata* employs two polyoxyethylene glycol comonomers, one of short polyoxyethylene chain length (m), and one of long polyoxyethylene chain length (n). At page 7, lines 26-30, *Hirata* states that the longer polyoxyalkylene chain length is important in keeping the cement particles dispersed, which is not surprising, as long polyoxyethylene chains constitute non-ionic surfactants, widely used.

The polyoxyalkylene comonomers described by *Hirata* (of both short and long chain length) include polyoxyethylene glycol homopolymers, polyoxypropylene glycol homopolymers, polyoxybutylene glycol homopolymers, and co- and terpolymers containing any combination of oxyethylene, oxypropylene, and oxybutylene groups. These co- and terpolymers may have their oxyalkylene groups present in blocks of the same oxyalkylene group, such as a block polyoxyethylene/polyoxypropylene copolyether glycol, or in random (so called "heteric") form. Thus, there are minimally eleven possibilities for *Hirata*'s short chain polyoxyalkylene comonomer, and another eleven for the long chain polyoxyalkylene comonomer, as follows, where EO = oxyethylene, PO = oxypropylene, and BO = oxybutylene⁵ : EO homopolymer; PO homopolymer; BO homopolymer; EO/PO random copolymer; EO/PO block copolymer; EO/BO random copolymer; EO/BO block copolymer; PO/BO random copolymer; PO/BO block copolymer; EO/PO/BO random copolymer; and EO/PO/BO block copolymer. This also ignores block/random and other well known types of polyethers which are within the *Hirata* disclosure as well. When the permutations and combinations of just the two ethylenically unsaturated polyoxyalkylene monomers are concerned, the possibilities are myriad indeed.⁶

⁴ Appellants recognize that both preferred and non-preferred embodiments are within the disclosure. However, not every disclosure, particularly in the case of multiple component compositions, is sufficient to direct one skilled in the art in any given direction.

⁵ Ignoring the fact that there are two butylene oxides, 1,2-butylene oxide and 2,3-butylene oxide, thus presenting even more possibilities.

⁶ Ignoring the possibility of block/random copolymers, there are no less than 66 possibilities, just from the two unsaturated polyoxyalkylene comonomers, of which *Hirata*

Coupled with this enormous number of possibilities for a *Hirata* copolymer is the fact that these copolymers, in hindsight, the only ones at all relevant, are but a subset of four compositions (i) to iv), described earlier). The teachings (or non-teachings) of *Hirata* must be viewed as a whole, not selectively, by hindsight.

Appellants' compositions also require a fourth comonomer, which the Office cites as *Hirata's* optional comonomer d). This set of comonomers is only optional, and *Hirata* used only one comonomer d), and in but two of his examples, this comonomer being ethylmethacrylate, totally different from Appellants' sulfate- and sulfonic-group containing comonomers. The comonomers d) of *Hirata* are any comonomer which is copolymerizable with his comonomers a), b), and c). *See Hirata* at page 3, lines 17-18. Even when only the seven classes of examples of comonomers d) (and mixtures thereof) cited on page 7, lines 35-47, are considered, the number of possibilities of a *Hirata* composition are truly enormous: one unsaturated carboxylic acid comonomer, eleven short chain unsaturated polyoxyalkylene comonomers, eleven unsaturated long chain polyoxyalkylene comonomers, and seven different comonomers d).⁷

In order to prepare a dispersant with properties which mimic casein, where does *Hirata* provide any guidance? Where would one start? What would one change? It is one thing to look at *Hirata* after viewing Appellants' claims, but this type of hindsight reasoning has been ruled improper for decades. *See, e.g. In re Wesslau*, 353 F.2d 238, 147 USPQ 391 (CCPA 1967).

Which of *Hirata's* four compositions i) to iv) would one choose as a starting point? According to *Hirata*, all are effective, and *Hirata* does not single out any one as being

discloses only one, that combination (two homopolymeric polyoxyethylene moieties) being different from what Appellants claim.

⁷ Not considering mixtures of these d) comonomers, and not considering the many, many comonomers d) which are broadly disclosed but not within the seven example categories.

preferred over the others. The composition i) is used in more examples than the others, but not always with the best results. *See, e.g.* Tables 1 and 2, where the cement admixture (3), an embodiment of a *Hirata* i) composition showed less effectiveness than a *Hirata* copolymer of his embodiment ii). This was also true in measuring slump in Table 3.⁸

Assuming, without there being any direction to do so, that one skilled in the art were to select a type i) copolymer of *Hirata* to formulate a casein mimic, what kind of type i) polymer would one use? The examples of type i) polymers all contain short and long polyoxyethylene group-containing comonomers. These are apparently preferred by *Hirata*, since they are used in all of his examples, regardless of type (types i) to iv)). However, these do not mimic the characteristics of casein. How would one modify them to do so? How even, would one skilled in the art modify these, irrespective of casein mimicry, a principle object of Appellants' invention, to produce a better fluidizing additive (plasticizer)?

Hirata apparently attempted to do so by varying the relative amounts of oxyethylene groups in his long and short polyoxyalkylene comonomers, and by varying the relative and total amounts of these comonomers. However, most of these (cement admixtures 6-10, Table 6) showed worse performance in slump than a type ii) additive.⁹ Compare the slump values of Table 6 with the slump values for cement admixture (1), a type ii) additive, in Table 3.

One might try to add some comonomers d), but which ones, and in which amounts? *Hirata* used 5% and 10% of ethylmethacrylate as a d) comonomer in cement admixtures 11 and 12 (Table 5), respectively, and the admixture containing the 10%

⁸ The slump measurements are difficult to correlate because each of the compositions is used along with another polymer, called PC Agent 1, identified as a polycarboxylic acid dispersing agent. (*See* page 13, lines 21-23.)

⁹ Type ii) additives are a mixture of two copolymers, each copolymer containing an unsaturated carboxylic acid monomer, one copolymer containing a short chain polyoxalkylene comonomer and the other copolymer containing a long chain polyoxyalkylene comonomer.

ethylmethacrylate fared better than cement admixtures 6-10, but much worse than cement additive 1 except after 60 minutes, where it showed improvement. With these results in mind, if one skilled in the art were to wish to further improve upon these compositions, what would they do? What is the teaching of *Hirata*? Answer: there is no teaching, no direction given. *Hirata* does not direct one skilled in the art to any combination of unsaturated polyoxyalkylene comonomers and/or comonomer(s) which can be expected to increase performance. At most, *Hirata* presents a combination of comonomers with which to experiment, without any clear guidance.

Appellants, on the other hand, took a route different from the direction taken by *Hirata* in his examples. Appellants' compositions employ two different polyoxyalkylene polyethers, one a hydrophilic and water solubility-imparting polyether, the other being a hydrophobic, water solubility-defeating polyether which is a polyoxypropylene or polyoxybutylene polyether. In addition, Appellants copolymerize an unsaturated sulfate- or sulfonate-group-containing comonomer.

Appellants compared their claimed products to several products within the scope of *Hirata*, and Appellants' products were surprisingly superior. For instance, comparative powder V2 was a copolymer of methacrylic acid and methoxypolyethylene glycol methacrylate containing on average 17 oxyethylene groups,¹⁰ corresponding to *Hirata's* additive type iii), a copolymer of an ethylenically unsaturated polycarboxylic acid and an unsaturated polyoxyalkylene glycol comonomer with chain length m , m being defined by *Hirata* as being

¹⁰ As is well known, polyoxyalkylation of methanol with ethylene oxide to produce a methoxy-terminated polyoxyethylene glycol always produces a statistical distribution of oxyethylene units. Thus, a 17 mol oxyethylate can be expected to contain shorter molecules (*i.e.* 12-16 oxyethylene groups) and longer molecules (*i.e.* 18-22 oxyethylene groups) in decreasing proportions as the number of oxyethylene groups differs from the average of 17. This would correspond to a mixture of short and long polyoxyethylene glycol monomers as required by *Hirata* for his type i) additives.

from 1 to 97 (page 2, lines 45-47). Both the initial slump and 30 minute slump were considerably less than any of Appellants' examples 1-6.

Also tested as Melflux 1641, a well known and widely used plasticizer from Degussa, which is a polyacrylic acid polymer with pendent polyoxyethylene glycol groups, which would also fall within *Hirata's* type iii) additive, and possibly within his type i) additive if the polyoxyethylene chain lengths are different. The 1 minute and 15 minute slump values were highly inferior to Appellants' examples 1-6, yet this is also a *Hirata*-type plasticizer.

As can be seen from Figures 1-3, the *Hirata*-type plasticizer (Melflux 1641) exhibited storage and loss moduli and $\tan \delta$ loss angle completely different from casein (Figure 2). However, Appellants' compositions (Figure 3) showed curves highly similar to casein. In this respect, note claim 23. *Hirata* does not teach or suggest the subject matter of this claim, and does not even mention or suggest preparation of any plasticizer which mimics the storage and loss moduli of casein plasticizers.

The case of *KSR v. Teleflex*, 550 U.S. 398 (2007), supports the patentability of the claimed subject matter over *Hirata*. *KSR* indicated that an invention is patentable over the art when the art proposes a choice of possibilities which are not highly limited, or where the result is unpredictable. Here, the absolutely enormous number of permutations and combinations of additive types (i) to iv)), short and long chain polyoxyalkylene comonomers, and optional fourth comonomer d) do not meet the *KSR* test of a limited number of choices. Here, the choices are virtually unlimited. Moreover, the result is not predictable. The claimed dispersants behave surprisingly better than dispersants falling within the scope of *Hirata*, both in terms of maintaining slump as well as mimicking the behavior of casein, as evidenced by the Figures.

It is emphasized that the many, many possibilities for copolymer compositions in the very broad *Hirata* disclosure do not comport with the *KSR* decision relative to "limited

possibilities." Note should be taken, for example, of *In re Chapman*, 2009-1270, 2010 U.S. App. Lexis 3781 (Federal Circuit, February 24, 2010), where affirmance of a rejection based on the rationale of *KSR* was reversed by the Federal Circuit when there were, in reality, only six choices rather than the three alleged by the Examiner.

KSR was also recently revisited in *Bayer Schering Pharma AG v. Barr Laboratories, Inc.*, 575 F.3d 1341 (Fed. Cir. 2009). As stated in *Bayer*:

[A]n invention would not have been obvious to try when the inventor would have had to try all possibilities in a field unreduced by direction of the prior art. When "what would have been 'obvious to try' would have been to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful" an invention would not have been obvious. *O'Farrell*, 853 F.2d at 903. This is another way to express the *KSR* prong requiring the field of search to be among a "finite number of identified" solutions. 550 U.S. at 421; *see also Procter & Gamble*, 566 F.3d at 996; *Kubin*, 561 F.3d at 1359. It is also consistent with our interpretation that *KSR* requires the number of options to be "small or easily traversed." *Ortho-McNeil Pharm., Inc. v. Mylan Labs., Inc.*, 520 F.3d 1358, 1364 (Fed. Cir. 2008).

Second, an invention is not obvious to try where vague prior art does not guide an inventor toward a particular solution. A finding of obviousness would not obtain where "what was 'obvious to try' was to explore a new technology or general approach that seemed to be a promising field of experimentation, where the prior art gave only general guidance as to the particular form of the claimed invention or how to achieve it." *O'Farrell*, 853 F.2d at 903. This expresses the same idea as the *KSR* requirement that the identified solutions be "predictable." 550 U.S. at 421; *see also Procter & Gamble*, 566 F.3d at 996-97; *Kubin*, 561 F.3d at 1359-60.

Here, there is no predictability to providing a plasticizer which mimics the plasticizing effects of casein. Moreover, as stated by the Court in *Bayer*, the prior art (*Hirata*) "gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful." In the language of *KSR*, here, there are not a "finite number of identified solutions." Also consistent with *Bayer*, the prior art does not "guide an inventor toward a particular solution," and as also stated by *Bayer*, "most inventions that are obvious were also obvious to try." *Bayer* @ 1347. The question, per *KSR*, is whether the choices are limited, whether the result is predictable, and whether the prior art provides guidance. That is not the case here.

Hirata provides no guidance to one skilled in the art to arrive at the claimed invention. The choices offered by *Hirata* are far from the finite, limited number involved in *KSR*, and there is no predictability with regard to the results obtained. Reversal of the rejection of the claims over *Hirata* under 35 U.S.C. § 103(a) is respectfully solicited.

B. Rejection of Claims 24 and 26

Claims 24 and 26 have been rejected under 35 U.S.C. § 103(a) over *Hirata* in view of *Haerzschel*.

Haerzschel, which is commonly assigned, is directed to providing flexible hydraulically-settable construction compositions by including in the composition a redispersible polymer powder (RDP) based on vinyl acetate, ethylene, and a higher vinyl ester. The preparation of RDPs is well known, and requires the emulsion polymerization of the monomers in aqueous dispersion to produce a dispersed phase of solid particles. The polymerization takes place in the presence of an emulsifier or protective colloid, far preferably the latter (*see Haerzschel* at column 3, lines 46-51). The dispersion, thus stabilized, is then spray dried with further protective colloid (column 4, lines 6-14) to produce the water-redispersible polymer

powder. Polyvinyl alcohol protective colloid is the exclusive protective colloid of *Haerzschel*. Polyvinyl alcohol is used in almost all RDPs as the protective colloid. It is water soluble. However, sulfonate-containing polymers are known to destabilize the polyvinyl alcohol protective colloid, resulting in destabilization and then coagulation.

Appellants have surprisingly found that the plasticizers of the present invention, despite being water-insoluble¹¹ rather than soluble, as all protective colloids are, and despite containing sulfate or sulfonate groups, can be used as spraying aids during the spray drying of polymer dispersions, without destabilization or coagulation. The resulting RDPs do not have the deficiencies of RDPs containing exclusively protective colloids such as polyvinyl alcohol.

It was surprising and unexpected that the plasticizers of the present invention are suitable as spraying aids, due to their water insolubility, especially as they also contain sulfate- or sulfonate-functional comonomer units.

As discussed previously, *Hirata* does not direct the skilled artisan to the plasticizers of the present invention. The rejection should be reversed for this reason alone. However, it is respectfully submitted that *Haerzschel* does not direct the skilled artisan to the invention of claims 24 and 26, even if *Hirata* rendered the claimed plasticizers themselves obvious, which he does not.

All the compositions of *Hirata* are water soluble, as indicated by his disclosure and examples. While it might be obvious to use a water soluble dispersant in the preparation of polymer dispersions or spray drying thereof, it is far from obvious to employ compounds which

¹¹ Note that in each and every example, the cement dispersants (plasticizers) of the invention are prepared in the form of a dispersion of solid particles. Thus, these cannot act as a protective colloid, which is water soluble. It is the polyoxypropylene moieties of Appellants' compositions which render them insoluble, as copolymers of the remaining ingredients are all known to be water soluble.

themselves are solid particles. In spray drying with a protective colloid, as taught by *Haerzschel* and numerous other references directed to preparation of RDPs, the water soluble protective colloid forms a water soluble protective coating or "cage" around the insoluble RDP particles, preventing them from coalescing to form agglomerates or even films. Upon adding to water, the protective colloid redissolves, liberating the polymer particles. A solid, particulate compound is not expected to do this. Moreover, a sulfonate group-containing spraying aid would be expected to destabilize and prevent formations of an RDP. Appellants' plasticizers very surprisingly do not do this.

The Office cites column 4, lines 55-60, as teaching the inclusion of a plasticizer (cement dispersant). This section of *Haerzschel* does indeed teach addition of such compounds, but not in a polymer dispersion to be spray dried. Rather, this portion of *Haerzschel* is directed to additives which may be added to the cementitious building construction material on site as it is mixed, not to an RDP prior to spray drying. *Haerzschel* does not teach or suggest adding a particulate cement plasticizer to a polymer dispersion and spray drying the composition. Reversal of the rejection of claims 24 and 26 over *Hirata* in view of *Haerzschel* is respectfully solicited.¹²

C. Rejection of Claim 28

Claims 28 has been rejected under 35 U.S.C. § 103(a) over *Hirata* in view of *Haerzschel* and *Debus*.

Debus teaches a plasticizing composition employing an anionic polyelectrolyte and a non-ionic, low foaming surfactant (non-ionic emulsifier). The three references cannot be combined because they teach in opposing directions and are physically incompatible.

¹² See also footnote 7 herein, and associated text.

Haerzschel, for example, in column 1, discloses that prior art dispersions stabilized by non-ionic emulsifiers are deficient. To overcome these deficiencies, *Haerzschel* teaches the use of polyvinyl protective colloids and exclusion of emulsifiers. *See Haerzschel* at column 3, lines 47-49. Emulsifiers are excluded.

However, *Debus* requires an emulsifier, a low foaming non-ionic surfactant, disclosed in column 3, lines 15-46. *Haerzschel* and *Debus* cannot be combined. They teach in mutually exclusive directions.

The Office states that this argument is not persuasive because *Haerzschel* and *Debus* are "only secondary references," which are cited for teaching specific components,¹³ and are combinable because they are both in the same field of endeavor. The latter (same field of endeavor) is a component of the *Clay*¹⁴ test for whether a reference is analogous or non-analogous art, not whether references can be combined.¹⁵ For combining references there must be "clear and particular" evidence of motivation to combine,¹⁶ and the references must be capable of physical combination. *In re Avery*, 518 F.2d 1228 (CCPA 1975). Moreover, the references cannot be combined if they teach in opposing directions. *See, e.g. DuPuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1326 (Fed. Cir. 2009).

¹³ An argument which smacks of forbidden hindsight reconstruction.

¹⁴ *In re Clay*, 966 F.2d 656 (Fed. Cir. 1992).

¹⁵ Non-analogous references cannot be combined. However, analogous references also frequently cannot be combined, for example if there is no motivation to do so; if the references' teachings are physically incompatible; or if the references teach in opposing directions. Merely because the references are in the same field of endeavor does not mean they are combinable.

¹⁶ *In re Dembiczak*, 175 F.3d 994 (Fed. Cir. 1999).

Here, *Haerzschel* teaches against using a non-ionic surfactant, while *Debus* requires its use. How can these references be combined?¹⁷ One cannot simply pick and choose so much of a reference as is needed to support a rejection while ignoring the salient features of the reference, whether the reference is a "primary" or "secondary" reference, *In re Wesslau*, 353 F.2d 238 (CCPA 1965), yet this is what the Office has done, by its own admission. The use of a surfactant is a salient feature of *Debus*; it is the essence of his invention, yet *Haerzschel* teaches to avoid such surfactants. These references cannot be combined.

The same is true for *Hirata* and *Haerzschel*. *Hirata*'s relevant compounds are non-ionic surfactants. They contain both short and long chain polyoxyalkylene groups, and are thus non-ionic surfactants. *Hirata* is combinable with *Debus*, since both teach non-ionic dispersants (emulsifiers). However, *Hirata* is not combinable with *Haerzschel*, and thus the rejection must be reversed for this reason.

D. Rejection of Claims 33-35

Claims 33-35 have been rejected under 35 U.S.C. § over *Hirata* in view of *Okazaki*, Derwant Abstract of JP 09-249442.

It is noted that no English translation of the underlying Japanese language reference has been provided to Appellants, in contravention to the Notice in the Official Gazette in relation thereto.

Hirata does not teach or suggest the plasticizers of Appellants, and the rejection should be reversed for this reason alone. However, *Hirata* also does not teach or suggest that his

¹⁷ This is also true for the rejection of claims 24 and 26 over *Hirata* in view of *Haerzschel*.

dispersants be used in conjunction with any redispersible polymer powder, and the office has not pointed to any portion of *Hirata* which suggests this.


Claims 33-35 pertain to compositions containing both Appellants' plasticizer and a redispersible polymer powder, prepared by spray drying the plasticizer and an aqueous dispersion of the redispersible polymer. *Hirata* nowhere discloses such a composition, nor does the abstract of *Okazaki*. *Okazaki* does not even disclose any redispersible polymer powder. The abstract only describes the addition of a mixed liquid containing 50 - 80 weight percent of an ethylene-vinyl acetate copolymer. An aqueous dispersion of an ethylene-vinyl acetate copolymer is not a redispersible polymer powder. It is not a powder, and it is thus not redispersible. Aqueous dispersions of ethylene-vinyl acetate polymers are known to exist which, when dried, do not form a redispersible polymer powder. A protective colloid and/or spraying aid must be added prior to spraying. It appears that *Okazaki* uses an aqueous dispersion to avoid the presence of polyvinyl alcohol protective colloid, since the latter is known to increase water absorption and decrease hydrophobicity of cured cement compositions. However, this cannot be ascertained because no English language translation of the underlying document has been provided. It is clear, however, that neither *Hirata* nor the abstract of *Okazaki* teach or suggest any composition including both an RDP and the Appellants' plasticizer. Reversal of the rejection of claims 33-35 is thus respectfully solicited.

Reversal of all rejections of record is respectfully solicited.

The fee of \$540 is being charged to Deposit Account No. 02-3978 via electronic authorization submitted concurrently herewith. The Commissioner is hereby authorized to charge any additional fees or credit any overpayments as a result of the filing of this paper to Deposit Account No. 02-3978.

Respectfully submitted,

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Enclosure - Appendices

VIII. CLAIMS APPENDIX

Claims 1 - 15. (Cancelled)

16. A dispersant comprising at least one copolymer prepared by polymerizing a polymerizable mixture consisting essentially of:

- a) 5 to 70 wt. % of one or more monomers selected from the group consisting of ethylenically unsaturated monocarboxylic acids, ethylenically unsaturated carboxamides, ethylenically unsaturated C₄₋₈ dicarboxylic acids and anhydrides thereof, and (meth)acrylate monoesters of C₂₋₈ dialcohols;
- b) 1 to 40 wt. % of one or more monomers selected from the group consisting of ethylenically unsaturated compounds with sulfonate or sulfate functional groups,
- c) 10 to 80 wt. % of one or more monomers selected from the group consisting of ethylenically unsaturated compounds of homopolyoxyethylene glycols with 1 to 300 oxyethylene units and terminal groups selected from the group consisting of OH-groups and ether groups –OR' and mixtures thereof, wherein R' is an alkyl, aryl, alkaryl or aralkyl residue with 1 to 40 C atoms,
- d) 5 to 80 wt. % of one or more monomers selected from the group consisting of ethylenically unsaturated compounds of polyoxyalkylene glycols consisting of 1 to 300 C₃₋₄ oxyalkylene units and terminal groups selected from the group consisting of OH-groups and ether groups –OR' and mixtures thereof, wherein R' is an alkyl, aryl, alkaryl or aralkyl residue with 1 to 40 C atoms, and,

- e) optionally, 0.5 to 10 weight percent of one or more hydrophobic comonomers selected from the group consisting of (meth)acrylate esters of C₁₋₁₅ alcohols and vinylaromatics, said copolymer having pendant polyoxyalkylene moieties derived from monomers c) and d)

the weight percentages based on the total weight of the copolymer, and totaling 100 wt. %.

17. The dispersant of claim 16, wherein the monomer units a) include one or more monomers selected from the group consisting of acrylic acid, methacrylic acid, itaconic acid, fumaric acid, maleic acid, and the salts of these carboxylic acids, maleic anhydride, acrylamide, methacrylamide, hydroxyethyl(meth)acrylate, hydroxypropyl(meth)acrylate and hydroxybutyl(meth)acrylate.

18. The dispersant of claim 16, wherein the monomer units b) include one or more monomers selected from the group consisting of vinylsulfonic acid and alkali and alkaline earth metal salts thereof, styrenesulfonic acid and alkali and alkaline earth metal salts thereof, methallylsulfonic acid and alkali and alkaline earth metal salts thereof, p-methallyloxyphenylsulfonic acid and alkali and alkaline earth metal salts thereof, and sulfonic acids of the general formula $\text{CH}_2=\text{CR}^1-\text{CO}-\text{X}-\text{CR}^2\text{R}^3-\text{R}^4-\text{SO}_3\text{H}$ and alkali and alkaline earth metal salts thereof, wherein X = O or NH, and R¹, R² and R³ are the same or different and have the meaning H and C₁ to C₃ alkyl, and R⁴ is C₁ to C₄ alkylene.

19. The dispersant of claim 16, wherein the monomer units c) include one or more monomers selected from the group consisting of acrylate esters and methacrylate esters of polyoxyethylene glycols and C₁₋₆ alkyl ethers of polyoxyethylene glycols the polyethylene glycol containing 1 to 150 oxyethylene units, the polyoxyethylene glycols having a terminal -OH or -OR' group.

20. The dispersant of claim 16, wherein the monomer units d) include one or more monomers selected from the group consisting of acrylate esters and methacrylate esters of polyoxypropylene glycols and polyoxybutylene glycols and C₁₋₆ alkyl ethers of polyoxypropylene glycols and polyoxybutylene glycols, the polyoxypropylene and polyoxybutylene glycols terminated with -OH or -OR' groups, the polyoxypropylene glycols and polyoxybutylene glycols containing 3 to 100 alkylene oxide-derived units.

21. Cancelled.

22. The dispersant of claim 16, wherein hydrophobic comonomer units e), which are (meth)acrylate esters of alcohols with 1 to 15 C atoms or vinylaromatics, are also used as comonomers.

23. The dispersant of claim 16, when employed in self-leveling, hydraulically setting mixtures, on loading in the linear viscoelastic region the storage modulus G' is higher than

the loss modulus G'' , on loading outside the linear viscoelastic region a tangent of the loss angle of < 80 results, and on subsequent relaxation within less than 15 mins the storage modulus G' is again higher than the loss modulus G'' .

24. In a process for the spray drying of aqueous polymer dispersions of homo- or copolymers of one or more monomers selected from the group consisting of vinyl esters of unbranched or branched alkylcarboxylic acids with 1 to 18 C atoms, acrylate esters and methacrylate esters of branched and unbranched alcohols with 1 to 15 C atoms, dienes, olefins, vinylaromatics and vinyl halides, in which a dispersant is employed, the improvement comprising selecting as at least one dispersant, a dispersant of claim 16.

25. In a hydraulically settable mortar composition wherein a cement plasticizer is employed, the improvement comprising selecting as at least one cement plasticizer, a dispersant of claim 16.

26. The process of claim 24, wherein the dispersant is an atomization aid in the spray drying of aqueous dispersions of vinyl acetate homopolymers, copolymers of vinyl acetate with ethylene, copolymers of vinyl acetate with ethylene and one or more other vinyl esters, copolymers of vinyl acetate with ethylene and acrylate esters, copolymers of vinyl acetate with ethylene and vinyl chloride, styrene-acrylate ester copolymers, and/or styrene-1,3-butadiene copolymers.

27. A construction chemical composition containing at least one hydraulically setting binder selected from the group consisting of Portland cement, aluminate cement, trass cement, slag cement, magnesia cement, phosphate cement, gypsum, lime, and waterglass, further comprising at least one dispersant of claim 16.

28. The composition of claim 27, which is a self-leveling floor filler or flowable screed.

29. The composition of claim 27, wherein said dispersant exhibits a plasticizing action.

30. Cancelled.

31. The dispersant of claim 16, wherein monomer

d) is an ethylenically unsaturated compound of a homopolyoxypropylene glycol with a terminal -OH group or -OR' group.

32. The dispersant of claim 16, wherein monomer

d) is an ethylenically unsaturated compound of a homopolyoxybutylene glycol with a terminal -OH group or -OR' group.

33. The dispersant of claim 16, further comprising a redispersible polymer powder comprising a homo- or copolymer of one or more monomers selected from the group consisting of vinyl esters of optionally branched C₁₋₁₈ alkylcarboxylic acids, (meth) acrylate esters, of optionally branched C₁₋₁₅ alcohols, dienes, olefins, vinyl aromatics, and vinyl halides, the dispersant prepared by spray drying an aqueous polymer dispersion of the redispersible polymer with the copolymer of claim 16.

34. The dispersant of claim 33, wherein the homo- and copolymers of the redispersible polymer are selected from the group consisting of vinyl acetate homopolymers, vinyl acetate/ethylene copolymers, copolymers of vinyl acetate, ethylene, and at least one vinyl ester other than vinyl acetate, copolymers of vinyl acetate, ethylene and acrylate ester(s), copolymers of vinyl acetate, ethylene, and vinyl chloride, styrene/acrylate ester copolymers, styrene/1-3-butadiene copolymers, styrene/1-3-butadiene copolymers, and mixtures thereof.

35. The dispersant of claim 33, wherein the homo- and copolymers of the redispersible polymer is an ethylene/vinyl acetate copolymer.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.